DOCUMENT RESUME

ED 316 229 IR 014 230

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TITLE Innovations in an Accounting Information Systems Course.
PUB DATE Jul 89
NOTE 15p.; Paper presented at the Annual North American Conference of the International Business Schools Computer Users Group (Harrisburg, PA, July 23-26, 1989).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Accounting; *Business Education; *Computer Assisted Instruction; *Databases; Evaluation; Foreign Countries; Higher Education; Instructional Development; *Simulation; *Spreadsheets; Student Evaluation
IDENTIFIERS University of Manchester (England)

ABSTRACT

A new approach to teaching an introductory accounting information systems course is outlined and the potential of this approach for integrating computers into the accounting curriculum at Manchester University (England) is demonstrated. Specifically, the use of a small inventory recording system and database in an accounting information course is described in order to illustrate the integrated nature of corporate data, the concepts of transaction processing and security, and the use of internally generated data for decision making, planning, and control. The coursework is centered around several major pieces of work. The first requires students to modify an existing suite of programs, in order to improve the controls within the system, the user friendliness, data validation, and usefulness of the reports, and to incorporate an audit trail to record all the transactions and amendments to the master file. In addition to the programming, the students have to document the system and review the controls within it. The second task involves using the inventory database which they have generated to make cash flow forecasts and plans for the business with a spreadsheet model and a database enquiry language. Thirdly, they also evaluate similar stock recording systems. The paper describes the development of the course, methods for assessing students' work, problems with course evaluation, and prospects for future developments. (Author/GL)

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INNOVATIONS IN AN ACCOUNTING INFORMATION SYSTEMS COURSE

Paper presented at the 1989 Annual North American Conference

International Business Schools Computer Users Group

Penn State, Harrisburg

July 23-26, 1989

by

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ABSTRACT

The purpose of this paper is to outline a new approach to teaching an introductory accounting information systems course and to show how it can be instrumental in integrating computers into the accounting curriculum.

The paper discusses the way a small inventory recording system and database is used in an accounting information systems course, to illustrate the integrated nature of corporate data, the concepts of transaction processing, security and the use of internally generated data for decision making, planning and control.

The coursework is centred around several major pieces of work. The first requires the students to modify an existing suite of programs, in order to improve the controls within the system, the user friendliness, data validation and usefulness of the reports and to incorporate an audit trail to record all the transactions and amendments to the master file. In addition to the programming, the students have to document the system and review the controls within it. The second task involves using the inventory database which they have generated to make cash flow forecasts and plans for the business with a spreadsheet model and a data base enquiry language. Thirdly they also evaluate several similar stock recording systems.

INTRODUCTION

For many years, accounting and business degree courses at Universities/Polytechnics have usually included a compulsory course as well as optional courses on business data processing and accounting informations systems, where one of the objectives has been to teach students about the role of computers in processing large volumes of transactions and producing useful information for management. Such courses typically included learning to program in BASIC, COBOL or PASCAL, on a mainframe computer, since it was reasoned, it was only by designing and writing a small system that students learned about the problems and issues in relation to computer systems.

While such courses are usually called accounting information systems or an analogous title, they are perceived by students as being programming courses, and as such, are traditionally unpopular courses in both the UK and North America. Students rarely perceive the value of such a course and its relevance to accounting. Reviewing the material that students are required to do, it seemed that students did not do exercises that covered the range of applications that computers are typically used for in management and business.

Furthermore, they did not become sufficiently proficient at the programming task that they could see the issues relating to accounting information systems. Programming is analogous to learning French. If they don't make sufficient progress, they get stuck at the level of the irregular verbs and never learn to communicate with others in French.

While most A.I.S. courses are centred around programming, some are entirely theoretical. But a much more serious defect is that neither type of course gives students any practical experience in using systems, assessing the extent to which an accounting system meets its objectives, is user friendly and most importantly is a secure system with good control features.

Information systems is the study of the types of information people need to make decisions and how information should be collected, stored and processed, in order to make that information available in a cost effective way. Despite the fact that the computer is only the tool for manipulating the data, most such courses lay heavy emphasis on the hardware and programming. Furthermore, the courses tend to borrow very heavily from apparently similar courses in Computer Science and as a result teach the analysis and design of information systems as a series of prescriptives, rules and guidelines.

Accountants need to learn about information systems for a variety of reasons. They will make use of the detailed and summary reports obtained from such systems for planning and control purposes. They will be involved in both their internal and external audit. Security and control of such systems will be a major issue. As users at a variety of different levels, they will usually be involved in specifying the requirements of a new system or modifications to an old one, approving the specification, training their staff and implementing it. They will use the information obtained from transaction processing systems as inputs to decision support systems, either of their own design or someone else's. Many of the issues involved in information systems design are relevant for the design and use of decision support systems. Clearly then, ac-

countants need to be able to have some appreciation of the task of systems analysts and designers, so as to be able to communicate with them, but from the perspective of users not designers. Yet most academic courses treat this subject from the perspective of the systems analyst/designer.

It has always been a difficult course to teach, relying as it does on knowledge and experiences which cannot be acquired in the classroom. Such courses, particularly those that are biased towards programming, have not been popular with students. Students typically see programming as something very separate from information systems. Furthermore, they cannot usually make the connection between information systems and accounting.

For accountants who are concerned with the provision of accurate and complete information to management and external users, it is imperative that they learn how such systems actually work. It implies using, testing and comparing systems as well as actually building them.

The rest of this paper describes and explains a course which has been developed as a result of this grant and attempts to come to terms with some of these issues. It is still in the process of development, but hopefully the methodology will have general applicability in a number of related courses.

THE DEVELOPMENT OF AN INFORMATION SYSTEMS COURSE

The information systems course is a compulsory second year course which is taught to about 160 students, the majority of whom have never touched a computer or even a typewriter. It is a 10 week course consisting of 15 hours of 50 minute lectures and ten 50 minute computer workshops, with one teacher to a class of 12 students.

The course was redesigned to take into account the fact that it is through this course that students are introduced to information technology, software tools, accounting information systems, and to the use of computers as an aid to decision making.

Information and the Accountant

The course starts by discussing the role of the accountant in relation to the provision of information in a business for the purpose of both planning and control. Students are introduced to the concept of decision support tools and are shown how to use Lotus. Keystroking is taught via a tutorial package supplied by the software company.

The lectures concentrate on the design of templates, the use of a diagonal layout, separation of data, calculations and output, model validation, testing, documentation, security issues etc. Since all the spreadsheet text books stress keystroking, it has been necessary to write course material and exercises which focus on these issues.

Since computers are being used as an aid to learning both accounting techniques and design and security concepts, and because students will be using computers so frequently in their working lives, they should be encouraged to

become as conscious as possible about the computing issues, eg the design of the spreadsheet, instructions, output layout etc. Questions can be included for the students to think about during the working of an exercise and to answer after completing an exercise which has involved the use of a predesigned template. For example, they can be asked about the measures that can be taken to check the accuracy of the templates and whether in the process of so doing, they found them easy or difficult to verify and why.

The Design of an Information System

The question is then raised about the kinds of information that are needed for management to make decisions about inventory levels, the accuracy and reliability of the data used in such plans, their source etc. It is at this point that routine transaction processing is discussed and the role of the accountant in specifying and implementing the system, training users and maintaining its security.

Systems analysis and design is a very difficult course to teach in a classroom context, relying so heavily as it does on practical experience, knowledge of user behaviour, etc.; areas in which students have little prior experience. It was therefore decided to make use of films which could convey these issues much more realistically and succinctly than could be done in lectures.

The Use of Films

Two of the "Big Eight" firms of accountants which have produced films for their own staff and client training programmes came to show their films to the students. These films are professionally produced, are of a very high standard and last about thirty minutes. One film dealt with the importance of system specification and showed what can go wrong if this was not clarified. In addition to examining the role of the various user departments, the DP manager and project manager, the film also looked at the role of the accountant who sat on the development committee.

The second film, used at the end of the course, dealt with the control issues which came to light after a systems analyst had left suddenly and then planted a time bomb in the programs, and the financial implications for the business. The significance and value of control measures, explained in the previous lecture, are very graphically shown. Again the role of the accountant was crucial.

It is worth mentioning at this stage a further film that has been used in the past for this course, that has had to be omitted for reasons of space. The BBC has made a dramatised version of "Equity Funding", the famous fraud involving the use of a computer to fabricate insurance policies and defraud the stock holders. This film was used as the basis for a compulsory examination question on the use of control procedures by management to prevent and minimise the effects of such a fraud.

Coursework

The students are currently taught the BASIC programming language because it

was, until recently, the easiest to teach in a short space of time, widely available and cheap. (Plans are in hand however to use dBase, next session.) The exercises were re-designed to include exercises covering the range of computer applications in business and management and within the sphere of business data processing specifically: data validation, production of well designed business reports, file handling and the updating of files in both sequential and random access mode.

A major problem in a course of this sort is the type of course assignments that validly inculcates the variety of skills, both theoretical and practical as well as behavioural, which are the objectives of such a course. A further problem is that since students in the UK are used to having their performance assessed solely in terms of a final examination at the end of their academic year, it can be very difficult to get them to do their course work with any sustained effort.

There are a number of interesting ways that class assignments may be set to overcome this problem. A series of exercises may be set that make use of the previous results as a building block. For example, the first exercise in this course required the students to calculate the pay of a group of workers. The second exercise required them to improve on this initial exercise by including data validation checks on the number of standard and overtime hours worked, rate of pay etc.

Projects, to be done as team, may be set. Students can learn to work in teams rather than individually and competitively. They learn a wider range of skills than are currently fostered in accounting courses. Group project work requires them to cooperate with one another. This type of learning situation makes them less dependent on the teacher and more dependent on each other. Most learning is in fact a social process, but the change in technology makes this more obvious.

However students do need help in this, to understand the generalisability of their experiences - that they are not unique experiences peculiar to them. It becomes, in principle, time permitting, possible thereby to teach them some of the problems involved in project management, eg to see why some groups had crises and other did not and what could be done to minimise their effects or to avoid their occurrence altogether.

One of the drawbacks of this type of work is that there may not be the time to give students adequate feedback about their work. One way round this is for all the groups to make copies of their work, which they distribute to their colleagues and the assignment is for them as the senior manager, to review the plans, budgets etc. of all the groups, including their own. This requires them to assume a different role and to study other people's work and analyse them critically and to see the implications for their work. This type of assignment also avoids the problem of how to assess an individual's contribution to the team. An individual assignment such as this gives each student the chance to participate as part of a team and to make his/her own assessment of the work. Most students said that they found it very useful studying the way that other people had tackled the problem.

While such assignments incorporate a greater degree of realism and encourage co-operation without fear of plagiarism, a substantial "stock" of such projects are required. They are much more time consuming for both staff and students.

The changes in the instructional methods, assignments and course assessments consequent upon the new technology, also affects the role of the teacher. The teacher becomes less concerned with being the primary conveyer of information to the students, and more a 'resource' or 'facilitator' of learning. But the teacher has to cope with the increased volume of tutorial demand per student. More informal contact is required to resolve difficulties the students necessarily encounter with the hardware and software. (The University system in the UK does not have the resources for auxiliary teachers, technical support staff or student demonstrators.)

Another aspect of computer technology that should be mentioned is word processing. In Britain, students typically turn in hand written work which is often poorly presented, unprofessional in appearance and difficult to read. Undoubtedly word processing (and the use of graphics) improves the presentation of the work (and reduces staff marking time), but from an educational point of view, there is another advantage that should be considered. Because it is so much easier for students to correct their work or even add to it, the content as well as the form should also improve. It is no longer necessary to leave writing up to the last. It can be done alongside other tasks in the knowledge that it can be easily altered as they are going along. The content of the students' documentation of the inventory recording system has improved markedly since they were required to turn in their work having used a word processor.

Course Assessment

These types of instructional methods and class assignments may have an impact on the final course assessment, particularly when this takes the form of an examination. Conventional examinations may not be the most suitable method of assessing the practical and social skills that students may have acquired. Other forms of assessment could include:

(1) a project;

(2) an oral presentation of their work;

(3) an essay, in examination conditions, based on a case study that has been set prior to the examination. In effect this becomes a prepared essay;

(4) ask students to review a previous exam paper, and to discuss which were the most difficult questions, etc.;

(5) ask students to prepare a multiple choice question on a book they have read or a particular topic;

These different forms of course assessment, and there are others, all have pedagogic value in their own right. The issue of course assessment in relation

to computer based courses is one that is of concern to most accounting teachers.

It was decided to set a project that accounted for 60% of the final marks and an essay, written in examination conditions on a predetermined topic which would count for 40% of the final marks.

Inventory Recording System

The purpose of the project was to give the students experience in using an accounting information system. Commercial packages can be far too complex for students, in the time available, to fully comprehend. Designing a new system, *ab initio* is likewise too difficult and time consuming. It was therefore decided to set a project which involved giving the students a listing of four separate programs which together make up the elements of a very rudimentary inventory recording system.

The first program allows the user to change various fields of a record in the inventory database by means of a menu (figure 1), thereby adding, deleting or editing records. Some fields cannot be altered from this program, as can be seen from the menu in Figure 1. The database consists of one hundred records, with some fourteen fields, most of which are empty records. Some fields are calculated automatically when values are input, eg. cost valuation. The program, as it currently stands, does not contain any data validation checks. Furthermore, the screen design is poor and there are few instructions or error messages.

The second program allows the user to ship or receive goods, as shown in Figure 2, thereby updating the quantity on hand. Other fields, such as the date of the last transaction, value of the inventory, sales to date, are updated automatically. However, the version given to the students does not show on the screen, the record that has been selected for updating, nor does it show the record after it has been updated, as does the database maintenance program. Thus it is possible to record a transaction for the wrong part by mistake. While the program does not permit the user to ship more goods than there are currently in stock, there are no data validation checks.

It is therefore possible to receive goods to a part number for which no standing information exists and to record a transaction for a negative quantity of goods and produce an erroneous result in the database for the quantity on hand. This will however be recorded in the audit trail which is shown in Figure 4. The user is not aware that a log is being kept of all transactions.

The third program lists all those records in the database where either the reorder point or reorder level is greater than zero. The database itself contains one hundred records, many of which are empty records. The report program flags all those parts whose quantity on hand has fallen below the reorder level (figure 3), counts the number of valid records and the total number of records processed. The latter figure is incorrect. The program produces no title for the output, no date or time when it was produced, nor does it give the user the option of obtaining a hard copy or an explanation of the asterisk. Furthermore, the layout of the report is not very clear.

Figure 1: Database Maintenance Program

```
RUN
Enter part number of record to be changed or -1 to quit?   109

-------------------------------------------------------------
PART #     PART NAME           QOH          C/P        C/VALUE
S/P        S/VALUE             P/DATE       S/DATE     SUPPLIER
REORDER P  REORDER QTY         TOTAL SALES  LEADTIME
-------------------------------------------------------------
109        MISCO DESK          100          10.00      1,000.00
20.00      2,000.00            01-01-88     11-14-88   ROCK1
10         10                  1,000        15
-------------------------------------------------------------
     Field to change:
        0 No change (Press RETURN key)
          (Part number may not be changed)
        2 Part name
          (Quantity on hand may not be changed)
        4 Purchase price
          (Purchase value may not be changed)
        6 Selling Price
          (Selling price may not be changed)
          (Date of last purchase may not be changed)
          (Date of last sale may not be changed)
       10 Supplier's code
       11 Reorder point
       12 Reorder quantity
          (Sales to date may not be changed)
       14 Leadtime

                                    Your  choice?  4

New purchase price?   12

-------------------------------------------------------------
PART #     PART NAME           QOH          C/P        C/VALUE
S/P        S/VALUE             P/DATE       S/DATE     SUPPLIER
REORDER P  REORDER QTY         TOTAL SALES  LEADTIME
-------------------------------------------------------------
109        MISCO DESK          100          12.00      1,200.00
20.00      2,000.00            01-01-88     11-14-88   ROCK1
10         10                  1,000        15
-------------------------------------------------------------
......
......
Etc.
```

Figure 2 : Record transactions

```
RUN
Enter transaction part number (RETURN same part, -1 to quit) ?  107

Transaction type :

    1 - Parts shipped
    2 - Parts received
    3 - Discontinue this transaction

            Your choice?         1
            Number of units?    10

Transaction reduces quantity on hand below zero
Press RETURN to continue?

Transaction type :

    1 - Parts shipped
    2 - Parts received
    3 - Discontinue this transaction

            Your choice?         2
            Number of units? -1999

Update is confirmed
.....
Etc.
```

Figure 3: Inventory Report

```
RUN
-------------------------------------------------------------
PART #     PART NAME           QOH          C/P        C/VALUE
S/P        S/VALUE             P/DATE       S/DATE     SUPPLIER
REORDER P REORDER QTY          TOTAL SALES  LEADTIME
-------------------------------------------------------------
101        Epson LX-80 Printer 100          12.00      1,200.00
20.00      2,000.00            01-01-88     11-14-88   ROCK1
10         10                  1,000        15
-------------------------------------------------------------
102        HP ribbons          110          8.50       935.00
11.00      1,155.00            11-14-88     11-08-88   LU890
100        1,000               100          30
-------------------------------------------------------------
...
Etc...
-------------------------------------------------------------

Number of stock items:          25
Number of records processed    201
```

The final program, the audit trail, is shown in figure 4 and lists the part number, a code for the transaction type (1 for parts shipped and 2 for parts received) and the size of the transaction. The program produces no headings for the output, or the date and time when it was produced, or details as to when the transaction was recorded or by whom. Neither is there an audit trail for the adjustments made to the database from the maintenance program. The incorporation of an audit trail is a major, but simple, feature of this system and one that is very relevant to an accountant.

Figure 4 : The Audit Trail

```
RUN
Read audit trail program
------------------------

111          1           10
110          2            2
111          2            3
101          1            1
107          2        -1999

End of audit trail
```

The students were asked to make the system more user friendly by merging the programs, using a menu, including more helpful screen messages and improving the usefulness of the reports and also to improve the security of the system by introducing password control, data validation checks and more details in the audit trail that logged the changes made to the stock levels.

The task, in programming terms, is not very difficult, but fairly time consuming. Most of the changes are cosmetic; error messages, instructions etc. They are not required to alter the basic file structure of the database which is a random access file. The only file handling is that of the audit trail which is a sequentially accessed file.

In addition they were asked to provide documentation, i.e. to write a user manual and a detailed program specification, including flow charts, test data and sample output, and to produce a report reviewing the controls within the program.

Decision Support Systems

The second part of the course assessment requires the students to make use of a inventory database of a small engineering company that has the same file structure as the one they have been working on, to prepare an inventory management plan or predict, say, future sales, inventory requirements, cash flow, etc. That is, to make use of information derived from a control system for planning purposes, using dBase in enquiry mode and Lotus. The purpose is to illustrate the integrated nature of corporate data, the concepts of file interrogation and transfers and the use of internally generated data for planning and control. Thus the course has come a full circle and has covered most

aspects of the use of information systems in accounting.

This assignment requires them to work in groups, not simply because there is so much work involved but because group work is a valuable learning experience in its own right. The plans produced by the group are not assessed. Rather, one compulsory question is set in the examination, which is based on this task and requires them to give illustrations from the plan they have produced. The question could be a very general one on the issues to be considered in the design of a decision support system.

Before the availability of this inventory database, the students were given a similar task that involved using a model that simulates the economic costs to central and local government of a plant closure, given the number to be made redundant, their age, sex, length of service, wage rates, etc. Such a model can be used in several ways, depending on the interests of the teacher. One way might be to compare the costs to the community with the benefits to the firm. This would involve giving the students additional data about the firm's cost structure in relation both to the plant that is closing and the one to which production is to be transferred. Alternatively, it might be set as an exercise to discuss its advantages and disadvantages as a planning aid for central/local government. (It was in fact used in the latter way as described above).

The software that is available such as spreadsheets, database management systems, operational research techniques, etc., are usually seen as decision support tools for managers. It is important that if they are to be used in this way that students appreciate the problems raised by the appropriateness of the data. If they are to be taught to become decision makers, they need to be given case material that is wide ranging, not simply numbers to manipulate. Too many exercises in decision making stress detached calculative rationality rather than involvement and intuitive and inferential reasoning.

FUTURE DEVELOPMENTS

The development of this course is an ongoing process. The course will be adapted and developed from year to year, according to students' needs and capabilities. In fact most case studies are developed in this way. It can be expected that in future years students will come to University with much more familiarity with information technology and that therefore more comprehensive systems can be used since less time will have to be spent acquiring basic computing skills.

A useful feature of this project is the way it can be added to from year to year. For example, these inventory recording programs which formed the basis of the students' projects have themselves resulted in 160, more sophisticated versions. A few of these can be used in the subsequent years course in several different ways. Students can be asked to review a few of them, thereby learning for themselves what constitutes a user friendly, useful and secure management information system. They are given suitable test data and criteria for evaluating the software. The following year's project might require them to add several new modules to the system.

Future developments include the use of dBase as the programming language rather than BASIC. The coursework will cover a wide range of accounting information systems by giving the students skeleton programs and requiring them to make alterations in relation to data validation, usefulness of the reports, etc., while at the same time retaining the basic structure of the course and the use of an inventory recording system as the focus of the course.

A further development of the course will require the students to make comparisons between their inventory levels, relative to sales, etc. and those for other, similar, corporations in that industry, by consulting a financial database, or a subset of it which has been put up on the students' network.

Thus it has become possible to organise the whole I.S. course around different aspects of an information system and the way that it can be used by a business organisation, thereby integrating more closely a course about computing and information systems into the accounting curriculum.

EVALUATION

The issue of the evaluation of the effectiveness or otherwise of such a course in achieving its objectives is an important one, but a difficul one to define. While it is possible to specify very general criteria, it is less easy to specify objective performance indicators of criteria that are practicable to measure.

While it is in principle possible to compare examination results from year to year in order to ascertain whether performance has improved, it is very difficult from such empirical studies to assess the causes of any such differences (statistically significant or otherwise) that are observed. Thus such measures that can be used to assess its effectiveness are likely to be very subjective. While subjectivity is unavoidable, what is at issue is the relationship between subjectivity and objectivity.

It can however be stated that since the course was revised in this way, the students knowledge of programming, systems concepts and ability to use computers has improved immeasurably. Furthermore, the standard of the project work has also improved over the two years that the course has been running in this form and it is confidently expected that this year's results will be better again as the course itself improves. The newer applications software has proved popular with the students and much more popular than the programming part of the course. Some of their suggestions were incorporated into the following year's course.

CONCLUSION

This paper has drawn attention to innovative ways that computers can be used in teaching information systems. It is indeed noticeable that many of the most innovative uses of computers are actually in subjects such as marketing, management and economics, rather than in information systems or computing courses per se!

The point was made earlier in the paper that there are three distinct reasons

for introducing computers into the accounting curriculum - for students to be able to make effective and efficient use of computers when the need arises, for students to be able to understand how accounting information systems work and how they may be used and finally for students to have access to another educational tool, in the same way that they have access to books and journals, as an educational resource. While the paper has focused on the first two aspects, it is very clear that an approach such as this is attempting to provide a cohesive framework for introducing and integrating computers into the University curriculum.

Although such a course is primarily concerned with teaching about computers and information systems, the new technology means that such a course can be much more closely integrated into the core accounting curriculum and its relevance becomes more apparent to the students. It is also the course where the students learn the basic computer skills required for using the computer based courseware on the other courses - the Trojan Horse.